P6850.32A

PRECISION APPROACH PATH INDICATOR WITH REMOTE MONITORING SUBSYSTEM (PAPI WITH RMS) FA-10620 PROGRAM IMPLEMENTATION PLAN

July 22, 1994

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

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Initiated by: ANN-300

RECORD OF CHANGES

DIRECTIVE NO: P6850.32A

CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL USE	CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL USE

F A A **Form 1320.5** (5-68) SUPERSEDES PREVIOUS EDITION

FOREWORD

This plan provides management direction for the implementation and acceptance of the Precision Approach Path Indicator (PAPI) System with Remote Monitoring Subsystem (RMS) into the National Airspace System (NAS). It defines the major functional responsibility levels, management direction, and overall program guidance to all responsible levels within the FAA for the procurement and implementation of the PAPI with RMS.

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SUMMARY OF SIGNIFICANT CHANGES

a. The history of the program was extended to include award of the New Bedford Panoramex Contract, January 8, 1993 (paragraph 22).

b. In the description of the clinometer, paragraph 31 d.(1), "digital liquid crystal display" was replaced with "dial".

c. Reliability and maintainability requirements were updated (paragraphs 32.d and 32.e).

d. Interchangeability requirements were updated (paragraph 32.f).

e. Interface specifications for the Maintenance Processor Subsystem, Link Control Unit, and Remote Monitoring Subsystem were updated (paragraph 33.a.).

f. MILESTONE SUMMARY SCHEDULE, Table 4-1, was updated.

g. Descriptions of the program management organization (paragraph 50), program contacts (paragraph 51) and program coordination (paragraph 52) were updated to reflect organizational and personnel changes.

h. PROJECT RESPONSIBILITY/COORDINATION MATRIX, Figure 5-1, was updated to reflect organizational changes.

i. The PAPI DRR schedule was updated (Table 7-1).

j. The membership of the acquisition phase configuration control board was updated (paragraph 74.a).

k. Descriptions of the maintenance concept and training were changed (paragraphs 90 and 91).

CHAPTER 1. GENERAL

1. PURPOSE. This Program Implementation Plan (PIP) provides technical guidance and direction for implementing the Precision Approach Path Indicator (PAPI) System with Remote Monitoring Subsystem (RMS) into the National Airspace System (NAS).

2. DISTRIBUTION. This plan is distributed to division level in the office of the Program Directors for Communications and Aircraft Acquisition, Navigation and Landing, Weather and Flight Service Systems; to division level in the NAS System Engineering, NAS Operations, Requirements and Life-Cycle Management, Office of Airport Safety and Standards, Aviation System Standards, Office of Acquisition Support, and Air Traffic Plans and Requirements; to branch level in the regional Airway Facilities (AF), Logistics, Airports, Air Traffic, and Flight Standards divisions; to division level in the Engineering, Test and Evaluation (T&E) Service at the Federal Aviation Administration (FAA) Technical Center; to branch level in the FAA Logistics Center and FAA Academy at the Mike Monroney Aeronautical Center; limited distribution to the Airway Facilities General National Airspace System sectors, sector field offices, sector field units, and sector field office units.

3. CANCELLATION. Order 6850.32, Precision Approach Path Indicator with Remote Monitoring Subsystem (PAPI with RMS) FA-10265 Project Implementation Plan, dated June 27, 1990, is cancelled.

4. AUTHORITY TO CHANGE THIS PLAN. The Program Manager for Navigation shall approve all changes to this plan.

5. EXPLANATION OF CHANGES. This revision expands the scope of the PIP to include project implementation planning for production PAPI systems produced by another contractor. In addition, it updates:

a. Project history and provides revised schedules for the New Bedford Panoramex (NBP) PAPI (Type No. FA-10620).

b. Project management functions to reflect organizational changes.

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CHAPTER 2. PROJECT. OVERVIEW

20. SYNOPSIS. As a result of the FAA's examination of the current airport visual navigational aid systems and determination to comply with International Civil Aviation Organization (ICAO) standards, the concept of a PAPI system has been developed. The PAPI program consists of procuring the equipment specified in FAA-E-2756, Four-Box Precision Approach Path Indicator, and installing and integrating the system as part of a visual aids establishment program.

21. PURPOSE. The PAPI system provides vertical visual landing guidance to the pilot. The PAPI project will provide an international standard system.

22. HISTORY.

a. After examination of many different visual glidepath systems in cooperation with the ICAO, the FAA adopted the PAPI as the national standard for a visual glidepath system. The PAPI system specification, FAA-E-2756, was baselined and the program project budgeted.

b. The first PAPI contract was awarded to Sonicraft, Inc., an 8(a) contractor. The contract was awarded October 15, 1985, for 90 systems and equipment deliveries with modifications were made through 1992.

c. On September 29, 1988, contract DTFA01-88-Y01051 was awarded to AVW Corporation of El Segundo, California, for 100 PAPI systems. This total was increased to 253 systems. In November 1993, the contract was terminated after delivery of 110 systems.

d. Contract DTFA01-93-Y-01022 was awarded January 8, 1993, to NBP. This contract will produce 31 PAPI systems built to the AVW PAPI system drawings. The contract also contains options for up to an additional 300 PAPI systems.

e. The PAPI equipment to be delivered under subparagraph 22.d. is the subject of this order.

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CHAPTER 3. PROJECT DESCRIPTION

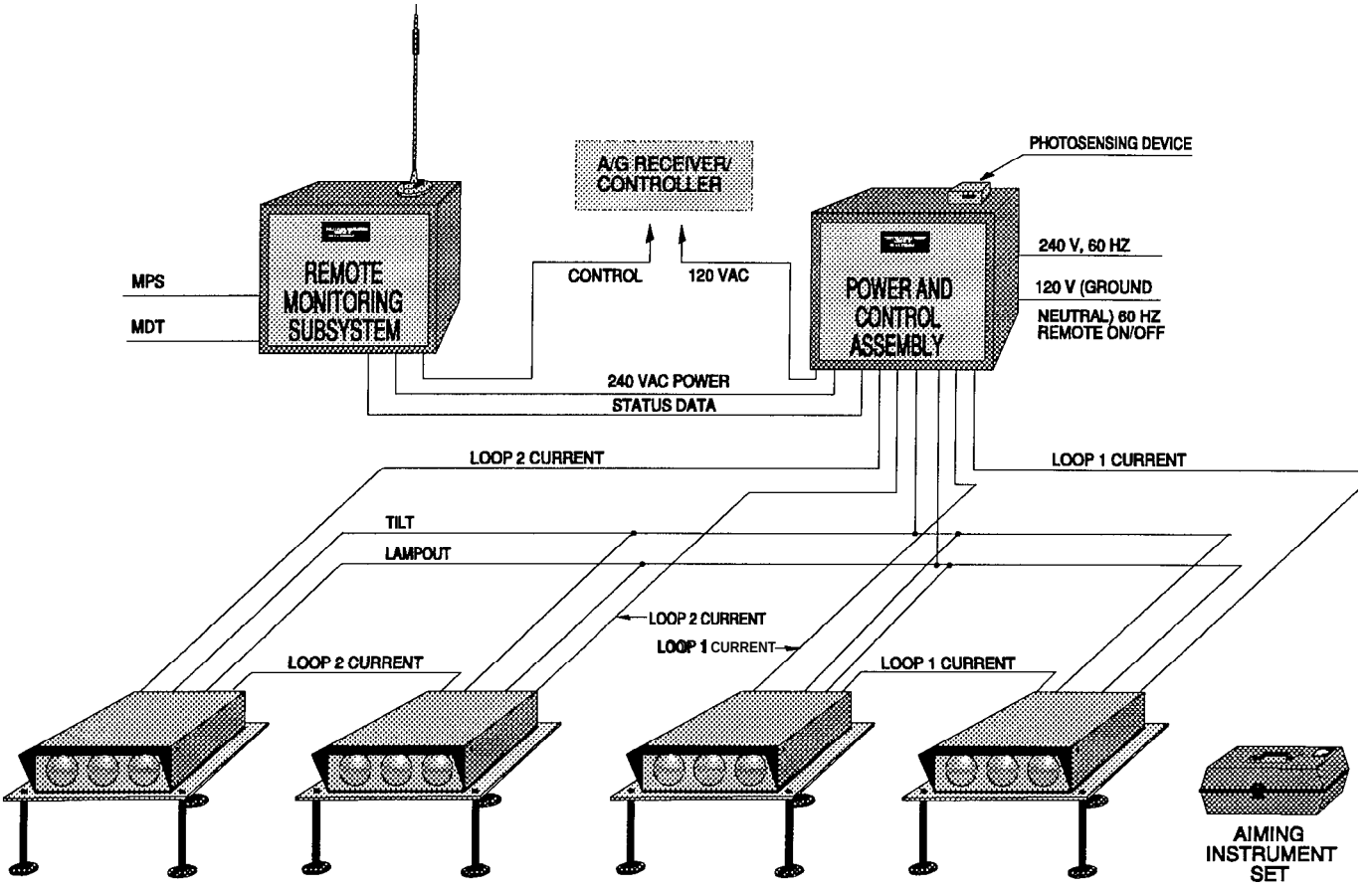
30. FUNCTIONAL DESCRIPTION. The PAPI system (Figure 3-1, Functional Relationship of PAPI Units) will consist of four lamp housing assemblies (LHA), a power and control assembly (PCA), and a RMS. The air/ground (A/G) receiver/controller is provided (when required) by the region/sector. It is not part of the PAPI system. The PAPI system will provide the pilot visual descent guidance to the runway during a non-precision approach.

a. Lamp Housing Assembly. Each of the four LHAs will be set at a different angle (20 minutes apart) and will emit a beam of high-intensity light, the upper half showing white and the bottom half showing red. As seen by the approaching pilot, the PAPI system will appear as a bar of four quick transition red/white light units whose on-glidepath signal (usually 3 degrees) is two red and two white lights. When the aircraft is slightly below glidepath, (between 2 degrees, 50 minutes and 2 degrees, 30 minutes), the signal will change to three red and one white light. When the aircraft is further below the glidepath, (below 2 degrees, 30 minutes), a fly-up signal of four red lights will be seen. Conversely, deviations above the glidepath will cause the outputs of the light units to appear to turn successively white. See Figure 3-2, PAPI System Signal Presentations.

b. Power and Control Assembly. The PCA contains the input circuitry required to operate the PAPI system. The PCA also supplies power for the PAPI system at two light intensity steps, one for daytime operation and one for night operation. The intensity of the lights is controlled by photoelectric circuitry.

c. Remote Monitoring Subsystem. The PAPI will have a built-in RMS function which will monitor current, voltage, tilt switch, and on/off status. The interface with the PAPI RMS will be a link control unit (LCU) to the maintenance processor subsystem (MPS). In addition to providing equipment status and alarm information for maintenance purposes, operational status of the lights will be determined and provided to the Tower Control Computer Complex (TCCC) at those Airport Traffic Control Towers (ATCT) so equipped. Should the airport be unmanned and control transferred to the TCCC, operational status information will be provided to the TCCC via the Remote Maintenance Monitoring System (RMMS) while operational control will be given directly to the pilot through use of the aircraft very high frequency (VHF) transmitter.

FIGURE 3-1. FUNCTIONAL RELATIONSHIP OF PAPI UNITS



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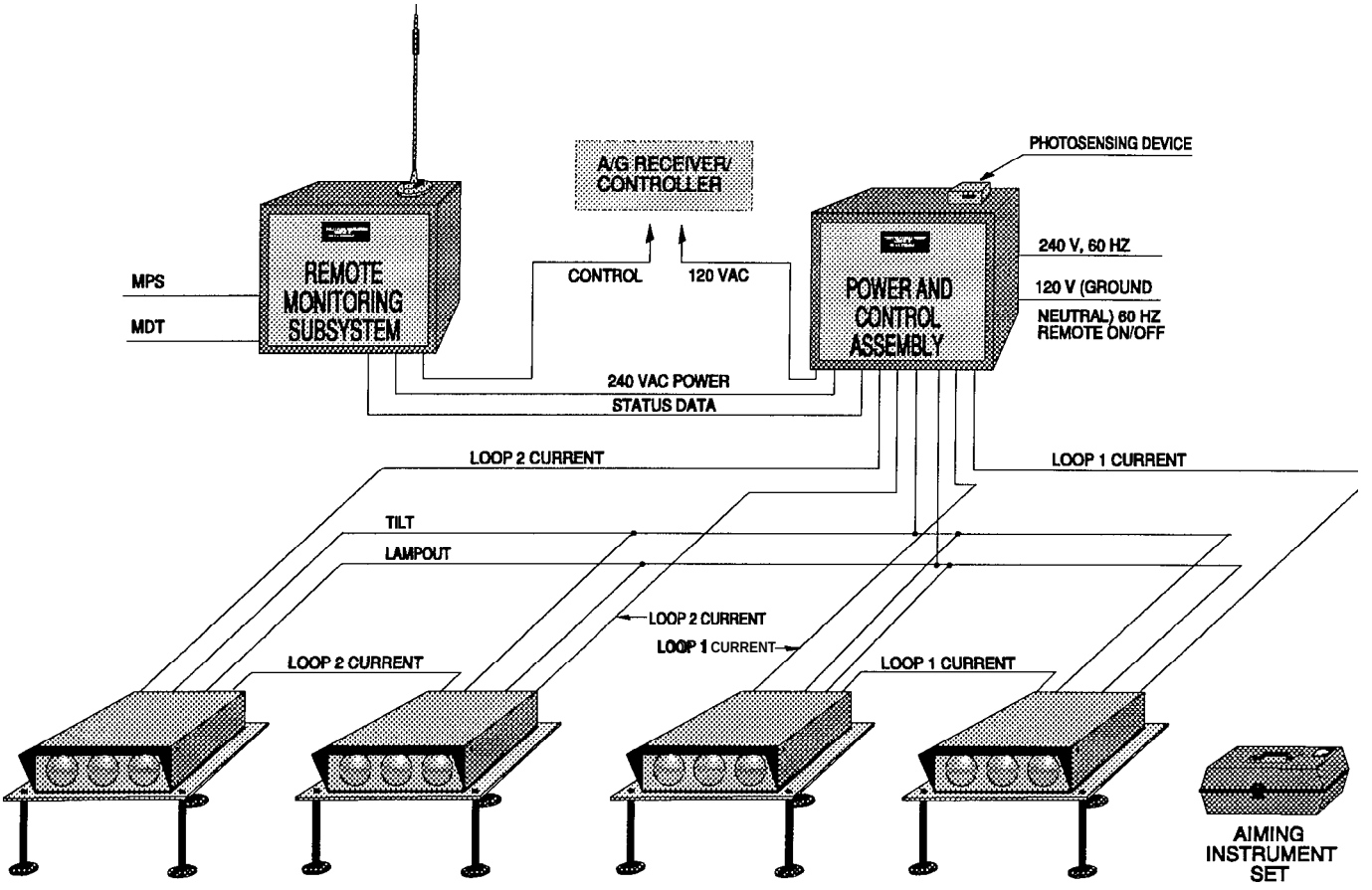

d. Aiming Instrument and Calibration Bar.

(1) Clinometer. An FAA approved clinometer will be used to accurately adjust the LHA during cross-leveling (lateral), longitudinal leveling, and elevation setting.

(2) Calibration Bar. A calibration bar is provided by the PAPI manufacturer to permit field checking and calibration of the clinometer provided with the PAPI.

e. Remote Radio Control System (RRCS). Control of the PAPI will be available from the TCCC at those ATCT's so equipped. At non-TCCC ATCT's control will be provided through the RRCS in ground-ground mode and aircraft very high frequency/ultra high frequency (VHF/UHF) radio (part time ATCT's only) in A/G mode. The region will have the option of using conventional control lines if that option is more practical.

31. PHYSICAL DESCRIPTION.

a. Lamp Housing Assembly. The PAPI system consists of four LHA's, each containing three lamps and three red glass filters. The four light units are arranged in a bar perpendicular to and on the left side of the runway and facing the approach end of the runway. The PAPI optical system is set by the manufacturer, and no additional adjustment, other than aiming the LHA's, is required. The LHA's [Figure 3-3, Lamp Housing Assembly (Side View) and Figure 3-4, Lamp Housing Assembly (Front View)] are installed on a rigid mounting base with three adjustable legs, with frangible couplings, to permit aiming of the light beam to any vertical angle from horizontal to up to 6 degrees. In addition, the mounting and adjustment hardware permit transverse leveling where any mounting leg may be up to 1 inch higher or lower than any other leg after installation. Within the LHA, the lamp mounting assembly permits firm and positive positioning of three easily replaceable lamps. Focusing of the optical system is accomplished by adjusting the filter. Three red filter assemblies, with a transmittance of at least 15 percent when lamps are operated at full intensity, are supplied with each LHA. In addition, three projection lenses, recessed under an overhang to minimize direct impingement or splash-back of rain or snow on the lenses, are mounted in a vertical frame at the front of the LHA. A terminal block rated to carry 10 amperes (Amp) at 250 volts alternating current (VAC) is provided at the rear of the LHA, along with terminal blocks for signal wiring. The entire LHA, excluding lamps and mounting legs, weighs 86 pounds.

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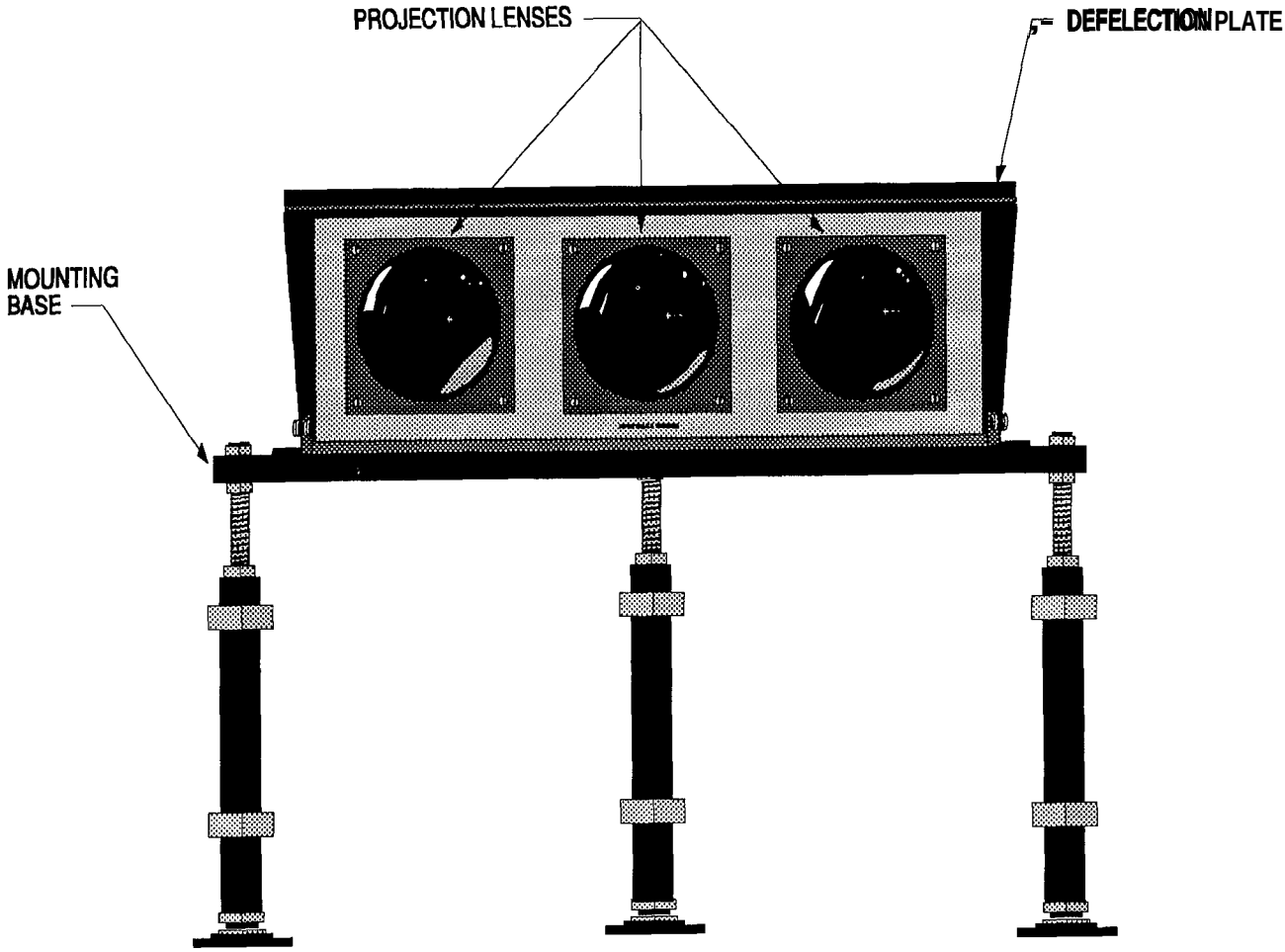
FIGURE 3-4. LAMP HOUSING ASSEMBLY (FRONT VIEW)



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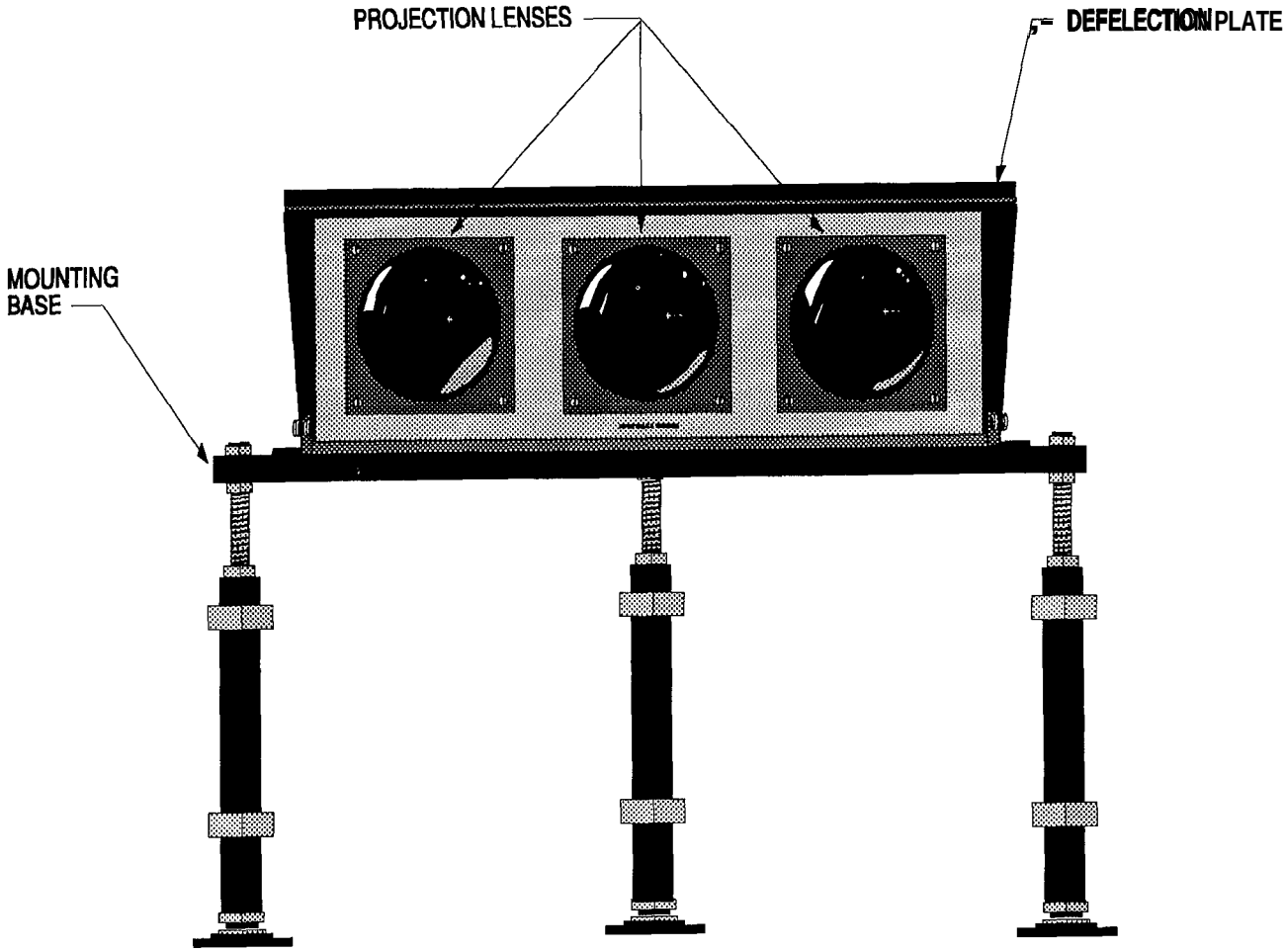

a. Power Requirements. Power requirements for the PAPI are outlined in Order 6950.2C, Electrical Power Policy Implementation National Airspace Systems Facilities. The PAPI system operates on a single phase, 60 Hertz (Hz), 120/240VAC grounded-neutral power source. In addition, the RMS uses a two-hour back-up battery power source to maintain operation during an alternating current (ac) power interruption. The lamp load consists of six 200 watt, PAR-64, or equal, 6.4 Amp lamps in each of the two-wire output circuits. The system is designed to suppress switching transients and to withstand transient increases superimposed on the 120/240VAC rms powerline input voltage that reach a peak value of 500 volts for as long as 50 milliseconds. In addition, the equipment is designed to withstand lightning transients superimposed on each input power line.

b. Siting. The PAPI must be sited and aimed so that it defines an approach path with adequate clearance over obstacles and a minimum threshold crossing height. If the runway has an electronic landing system glide slope already established, the PAPI is installed so that the visual glidepath angle will coincide with the electronic glide slope. When an electronic glide slope is not present, one must determine a position and an aiming for the PAPI which will produce the required threshold crossing height and clearance over obstacles in the area. Generally, the PAPI is installed in the configuration depicted in Figure 3-5, PAPI System Configuration. Order 6850.2A, Visual Guidance Lighting Systems, dated December 17, 1981, cites the siting criteria.

c. Electromagnetic Interference. Conducted interference levels on incoming ac power leads, control leads, and signal leads shall not exceed the limits for CE03 as defined in MIL-STD-461, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, for its equipment classification. Radiated emission over the frequency range of 30 kiloHz to 400 megaHz (mHz), at a distance of 20 feet, shall not exceed the limit for RE02 of MIL-STD-461.

d. Reliability. The reliability parameters for the PAPI system require that the mean time between failure (MTBF) for the LHAs and the PCA shall not be less than 2,500 hours. The MTBF for the RMS shall be not less than 11,900 hours. The contractor will demonstrate conformance with these requirements by performing a reliability analysis in accordance with MIL-HDBK-217B, Reliability Stress and Failure Rate Data for Electronic Equipment, and in accordance with RADC-TR-75-22, Nonelectronic Reliability Notebook.

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e. Maintainability. The PAPI system will have a mean time to repair of not more than 30 minutes with no single restoration exceeding 3 hours in duration. Mean periodic maintenance time for the PAPI system shall not exceed 2 hours per 3 months, including routine inspection. These values are established based upon the fact that each PAPI site will be outfitted with a one for one spare line replaceable unit (LRU) in accordance with the current PAPI maintenance concept.

f. Interchangeability. All parts of the unit furnished under a single procurement will be manufactured to a tolerance that permits interchangeability of any part with a like part of any other unit. In addition, all parts of units manufactured by NBP will be interchangeable with like parts manufactured by AVW under the previous PAPI procurement.

33. INTERFACES. The PAPI system has the capability of being monitored by the RMMS described in FAA-E-2782, Remote Maintenance Monitoring System, Core System/Segment Specification, when provided. Its other remote maintenance interfaces have not yet been defined, although the PAPI will interface through existing LCU's with the Maintenance Control Center (MCC) and with the TCCC (where installed). The PAPI shall also be interfaced with the RRCS described in specification FAA-E-2723, Remote (Radio) Control System, and in Order 6850.2A.

a. Remote Maintenance Monitoring System. Interfacing of the LCU with the RMS units and the MPS is normally accomplished via the use of the built-in modems and the government furnished equipment (GFE) radio links. The LCU will be provided with a UHF radio link operating in the 406 to 420 MHz band. The frequencies assigned for the radios are site dependent. Therefore, it is imperative that any proposed changes to PAPI locations be initiated as soon as possible to place the proper radio at the correct site at minimal cost. Other interface criteria are described in the remainder of this paragraph.

(1) The MPS interface is designed in accordance with EIA Standard RS-232C wired as a synchronous data terminal equipment (DTE), duplex, type D interface. The MPS interface is wired to a rear mounted female MIL-C-24308 (MS 18725) connector. The data rate across the MPS interface shall be 2400 bits per second (bps).

(2) The LCU and the RMS terminal interfaces are both designed in accordance with EIA Standard RS-232C, wired as asynchronous data interfaces, use even parity, and automatically adjust to the following baud rates: 110, 150, 300, 1200, 2400,

4800, 9600, and 19,200. The terminal interface is wired to a front panel mounted female connector, MS 18725, in accordance with MIL-C-24308. ASCII characters received via the terminal interface shall also be transmitted, i.e., echoed, as the characters are received.

(3) Normally, the data interface between the LCU and each equipment RMS is a half-duplex, 2400 bps, multipoint data radio link. However, provision to operate via a point-to-point, half-duplex, two-wire phone line is also available by means of wirestrapping. Minimum phone line quality in this configuration shall be 3002 (AT&T Tariff FCC-260) per Bell System Technical Reference Publication 41004, or equivalent. Since AT&T FCC-260 has been replaced by AT&T Tariffs 9, 10, and 11, the current line equivalent is channel type 5 conditioned C-2 with protocol type NO of AT&T Publication 43202. The line may be unconditioned (basic) if the modems can still transmit 2400 bps at an acceptable bit error rate. Order 6000.22, Maintenance of Two-Point Private Lines, is scheduled to be updated to provide guidelines for required line characteristics to remove dependence on the AT&T standard.

(4) In addition to the interface characteristics described in this paragraph, the LCU will also be capable of interfacing with the RMS in accordance with EIA Standard RS-232C wired as a synchronous, DTE, duplex, type D interface. The DTE interface shall have the capability to utilize either the built-in modem for transmission or an external modem meeting the requirements of FED-STD-1005 (except paragraphs 2.2 and 2.4 and associated subparagraphs). Data rates across the DTE interface shall be programmable to 2400, 4800, 9600, and 19,200 bps.

b. Remote Control Interface Unit. The remote control interface unit provides the PAPI system with connectivity to two external remote control systems. One of these, the Remote Radio Control System (RRCS) described in FAA-E-2723, provides control of the PAPI system to an operator in the ATCT. The other, described in Advisory Circular AC 150/5345-49A, Specification L-854, Radio Control Equipment, provides control of the PAPI system at an unattended facility to the pilot via an A/G receiver. The remote control interface unit is not provided with the PAPI system and must be purchased separately if required.

c. Remote Monitoring Subsystem. The PAPI RMS consists of voltage and current sensors, cabling, connectors, the mounting hardware necessary to route required samples of signals and control functions to the mounted units of the PAPI RMS, and a data acquisition system. The data acquisition system consists of a

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CHAPTER 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULES AND GENERAL STATUS. The procurement of the PAPI with RMS is divided by fiscal year.

41. MILESTONE SUMMARY SCHEDULE. The current milestone schedule is shown in Table 4-1, Milestone Summary Schedule. Project events are scheduled in relationship to the date of contract award. The dates listed are for those milestones completed or anticipated.

TABLE 4-1. MILESTONE SUMMARY SCHEDULE

EVENT	DATE
NBP	
Contract Award	1/8/93
Test and Evaluation Master Plan Approved	6/23/94
Shakedown Test Plan Approved	6/25/94
Integration Test Plan Approved	6/25/94
First System Delivery to Test and Evaluation Site	6/13/94
Operational Test and Evaluation Begins	7/18/94
Finish System Integration & Checkout	9/12/94
Finish Integration & Shakedown Tests	9/25/94
First System Delivery FAA Logistics Center	10/12/94
Last System Delivery FAA Logistics Center	12/31/94

42. INTERDEPENDENCIES AND SEQUENCE. Delivery of PAPI systems under the NBP contract are scheduled to begin in October 1994. The following projects were identified as having interdependencies with the PAPI project.

a. The Airport Cable Loop Program. This program establishes a network with all of the airport's power and control cables. The PAPI will precede the Airport Cable Loop Program at some locations which might lead to their being dropped from control cable loops, although power cable loops may still be required.

b. The Airport Telecommunications Program. This program will establish the specifications and criteria for a reliable and flexible distribution system for low activity and medium activity airports. The Airport Telecommunications Program is related to all airport projects which require buried cable for control signals or communications between sites. The Airport Telecommunications Program investigates frequency interference and alternative communications media within the Capital Investment Plan. The PAPI impacts this program only in the landing area since the PAPI does require some buried cable for the system to function.

c. The Remote Maintenance Monitoring System. The RMMS program has been developed to provide maintenance monitoring and control equipment for FAA facilities so that performance monitoring, certification, and control could be accomplished from centralized work centers. In some cases, the RMMS program may not be fully implemented until some time after installation of the PAPI system has been completed. In these situations, the reduction in the frequency of on-site maintenance visits derived from the integration of the PAPI RMS with the RMMS may not be realized until some time after the PAPI has been installed.

43.-49. RESERVED.

a. The Airport Cable Loop Program. This program establishes a network with all of the airport's power and control cables. The PAPI will precede the Airport Cable Loop Program at some locations which might lead to their being dropped from control cable loops, although power cable loops may still be required.

b. The Airport Telecommunications Program. This program will establish the specifications and criteria for a reliable and flexible distribution system for low activity and medium activity airports. The Airport Telecommunications Program is related to all airport projects which require buried cable for control signals or communications between sites. The Airport Telecommunications Program investigates frequency interference and alternative communications media within the Capital Investment Plan. The PAPI impacts this program only in the landing area since the PAPI does require some buried cable for the system to function.

c. The Remote Maintenance Monitoring System. The RMMS program has been developed to provide maintenance monitoring and control equipment for FAA facilities so that performance monitoring, certification, and control could be accomplished from centralized work centers. In some cases, the RMMS program may not be fully implemented until some time after installation of the PAPI system has been completed. In these situations, the reduction in the frequency of on-site maintenance visits derived from the integration of the PAPI RMS with the RMMS may not be realized until some time after the PAPI has been installed.

43.-49. RESERVED.

(6) Testing. Reviewing and approving manufacturers' equipment test procedures. Establishing requirements and approving plans for T&E of engineering activities of the FAA Technical Center.

(7) Installation. Managing installation activities for current and future systems to assure a high level of system performance.

(8) Acceptance. Providing research, engineering, development, design, and systems analyses associated with acquisition and acceptance of hardware and software.

c. Navigation and Landing Engineering Division (ANN-600). ANN-600 is responsible for providing the support/resources for the engineering, acquisition, and implementation of navigation and visual systems.

d. Associate Program Manager for Engineering (APME) PAPI. The APME for the Visual Aids Program is the principal element of ANN-600 responsible for directing, managing, and integrating engineering activities for the PAPI. In addition, the APME prepares technical installation instructions, manages in-transit material for construction and installation, and maintains currency of material systems and control over equipment inventory.

e. Contracting Officer's Technical Representative (COTR) PAPI COTR. The PAPI COTR is the principal element responsible for providing engineering advice and consultation to the contracting officer (CO) during procurement and reviewing contractor requests, contractor documentation, and progress payments.

f. Associate Program Manager for Testing (APMT) (ACD-110). The APMT, ACD-110, will assume all testing responsibilities as contained in Order 1810.4B, FAA NAS Test and Evaluation Policy. These responsibilities include preparing test plans, procedures, and reports; coordinating with Air Traffic, AF, the program office, and other users to develop Operational Test and Evaluation (OT&E) test requirements; preparing and coordinating test related program directives; directing the conduct of OT&E/integration; and supporting acceptance testing at the first field site.

g. Associate Program Manager for Logistics (APML) (AAI-600). The APML is responsible for ensuring all applicable NAILS element requirements are managed and integrated into new

NAS subsystems and equipments and facilities in a manner which provides for total life cycle supportability.

h. Associate Program Manager for Contracting (APMC) (ASU-310). The APMC is a CO with the authority to enter into, administer, or terminate contracts and make related determinations and findings to the PM.

i. Associate Program Manager for Quality (APMQ) (ASU-400). ASU-400 is responsible for the performance of factory inspection of the PAPI system and will assign an APMQ and a Quality Reliability Officer (QRO) at the time the contract is awarded. The APMQ will provide support to the program office and is the central point of contact for quality assurance matters between the program office and ASU-400. The QRO is the FAA's representative at the contractor's facility and is responsible for verifying the acceptability of the contractor's quality assurance system, performing inspections and test witnessing, and accepting or rejecting items submitted by the contractor in accordance with the terms and conditions of the contract.

51. PROJECT CONTACTS.

a. Program Director for Navigation and Landing. Donald A. Stadtler, Acting ANN-l, Federal Aviation Administration, 2100 2nd Street, SW., Washington, DC 20593, FTS (202) 267-6595.

b. Program Manager for Navigation. Charles B. Ochoa, ANN-300, Federal Aviation Administration, 2100 2nd Street, SW., Washington, DC 20593, FTS (202) 267-6672.

c. Navigation and Visual Systems Engineering Division Manager. Rial F. Sloan, ANN-600, Federal Aviation Administration, 2100 2nd Street, SW., Washington, DC 20593, FTS (202) 267-6594.

d. Associate Program Manager for Engineering, PAPI. Seth Cousins, ANN-600, Federal Aviation Administration, 2100 2nd Street, SW., Washington, DC 20593, FTS (202) 267-1881.

e. Contractins Officer Technical Representative. Seth Cousins, ANN-600, Federal Aviation Administration, 2100 2nd Street, SW., Washington, DC 20593, FTS (202) 267-1881.

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and policies for supply support requirements, material management, project material, field logistics management, cataloging, inventory management, environmental issues, and reutilization and disposal.

f. Contracts Division (ASU-300). ASU-300 performs cost/price analyses of the contractor's proposals and participates as a member of the Source Evaluation Board on PAPI with RMS procurement subject to the CO. In addition, ASU-300 provides procurement support for the PAPI program and administers contracts for the PAPI with RMS equipment. ASU-300 also designates a CO who is responsible for all contractual matters. The CO is the only individual authorized to approve contract changes impacting price, delivery, or schedule.

g. Industrial Division (ASU-400). ASU-400 performs factory inspection of the PAPI with RMS. ASU-400 assigns a QRO at the time the contract is awarded. The QRO is the FAA's representative at the contractor's facility and is responsible for verifying quality control. The QRO is directed by FAA policy and procedure and by the terms and conditions of the contract.

h. FAA Logistics Center (AML). AML accepts deliveries of PAPI systems from the manufacturer, manages the dissemination of PAPI systems to the regions, provisions spare parts for the PAPI system, provides exchange and repair service for faulty LRUs returned from site maintenance activities, and maintains the technical data for the PAPI system.

i. FAA Academy (AMA). AMA-400 schedules and teaches organic FAA maintenance training courses for AF site-level maintenance technicians and updates existing training courses when required. AMA-500 provides training for air traffic personnel in the form of a system user guide.

j. Airway Facilities Training Division (AFZ-100). AFZ-100 coordinates with the FAA Academy to ensure that AF training requirements are met in a timely manner. AFZ-100 controls quotas for the training courses, provides the Academy with quota spreadsheets for each training class, and provides travel and per diem funding for students.

k. Flight Standards Service Planning and Program Management Branch (AFS-121). AFS-12 manages the prioritization and validation of equipment and facilities for the PAPI program.

l. Office of Aviation System Standards, Flight Procedures & Inspection Division (AVN-200). AVN-200 is responsible for providing the coordination to accomplish the following functions:

(1) Providing the support necessary for accomplishing the preliminary (preparatory) and commissioning flight inspections, as specified in the PAPI Master Test Plan.

(2) Determining if the operational status of a facility or system is in accordance with the established tolerances.

(3) Certifying the facility or system for operational use in the NAS when all operational requirements have been met.

m. Airport Technology Branch (ACD-110). ACD-110 provides an APMT who provides test support in accordance with Order 1810.4B. As part of this support, ACD-110 writes test procedures for and performs NAS integration testing. The Air Traffic Control Sustaining Engineering Division, Maintenance Automation Program (ACN-1000) assists ACD-110 with these activities for RMMS testing.

n. Navigation/Landing Life-Cycle Division (ALM-600). The APML is responsible for the management of the NAILS program, which includes eight elements: maintenance planning; direct-work maintenance staffing; maintenance support facilities; supply support; packaging, handling, storage, and transportation; support equipment; technical data; and training, training support, and personnel skills. The APML organizes, schedules, and chairs all NAILSMT meetings and develops, publishes, and updates the Integrated Logistics Support Plan (ILSP).

o. FAA Regional Offices. The FAA regional offices through established administrative structures coordinate with all responsible parties to assure adequate funding, establish system commissioning/service availability dates, assign project field representatives, and determine utility availability for the PAPI system. The regions also provide field engineering, as required, to support preparations for the installation of the PAPI system and the installation of RRCS equipment to monitor/control the visual aids, order government furnished materials for tools and test instruments to support installation and acceptance, tailor installation drawings to be site specific, initiate work orders and travel authorization, and assign field personnel. If A/G radio control equipment is required, the region will purchase the unit. The following regional offices are responsible for the

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inspection (JAI), providing the sector all data necessary to prepare warranty failure reports on items failing prior to JAI, supporting the preparation of the FRDF, and providing regional AF division representatives for participation in the JAI.

(j) Establishing and maintaining a follow-up file for monitoring and clearing all JAI report exceptions, reviewing all JAI reports and follow-up reports for accuracy, completeness, and proper distribution, taking appropriate and timely actions to clear JAI report exceptions, and identifying additional sources of funds or initiating budgetary action, as necessary, to clear exceptions.

(2) Regional Airports Division. Coordinating the identification of each PAPI system on the airport sponsor's approved layout plan in accordance with the requirements of section 511 (a)(15) of the Airport and Airway Improvement Act.

(3) Airway Facilities Sector.

(a) Reviewing contract documents and engineering plans during the engineering phase and providing comments to the regional AF division.

(b) Providing personnel as required at appropriate times throughout the project to witness and/or participate in construction, installation, tuneup, tests, and collection of technical reference data.

(c) Coordinating the release of equipment currently in use to regional AF division establishment personnel for use in the project.

(d) Maintaining properly those components of an existing facility which are unaffected by an improvement project.

(e) Ensuring that modification/CCDs and documentation are current on installed equipment for the purpose for which the equipment was being used prior to the project.

(f) Providing a representative to serve as the joint acceptance board chairperson and other qualified personnel for participation in the JAI, preparing and distributing the JAI report, and assuming maintenance responsibilities and custodianship for facilities, systems, or equipment at the conclusion of JAI.

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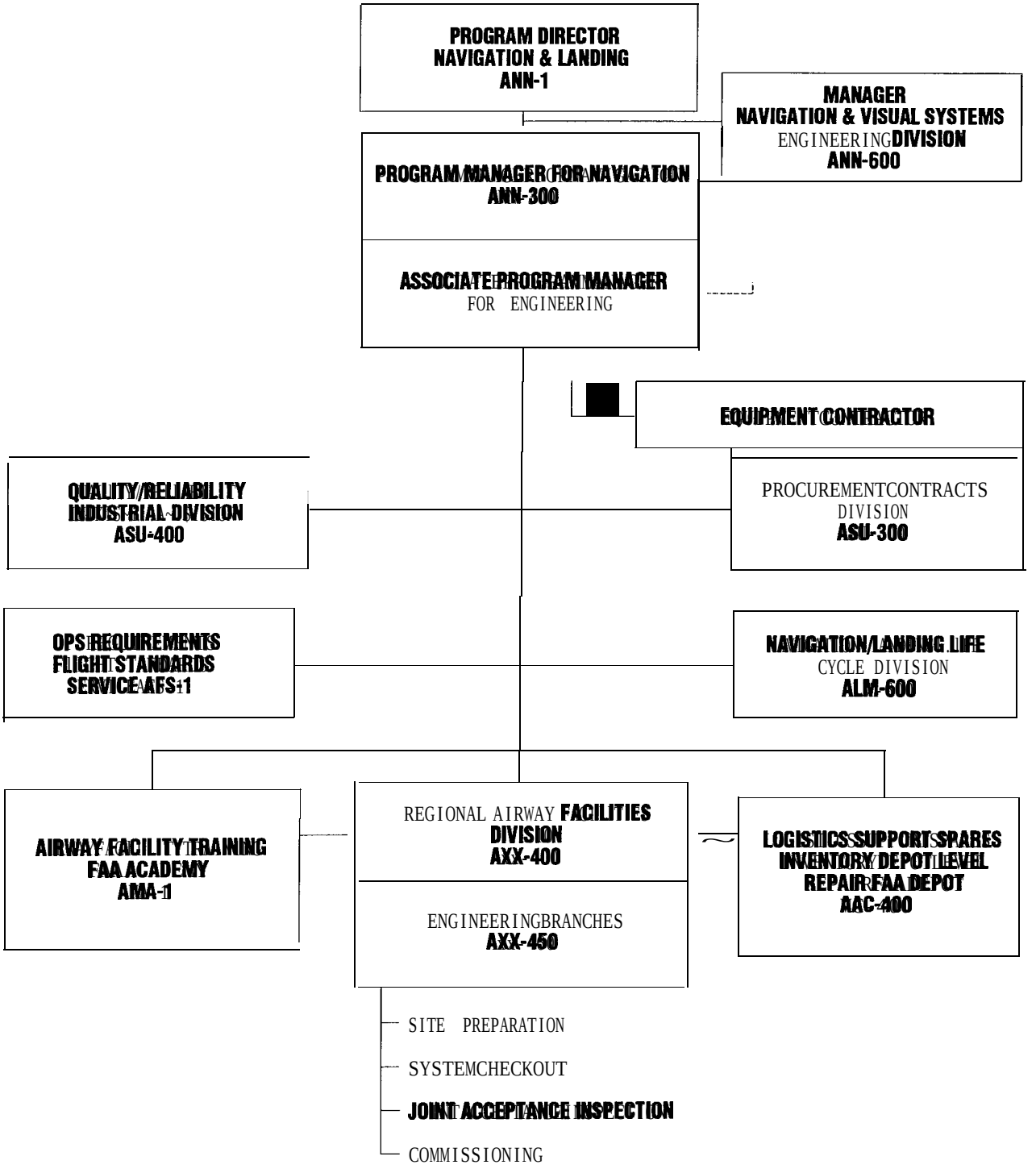
FIGURE 5-1. PROGRAM RESPONSIBILITY/COORDINATION MATRIX



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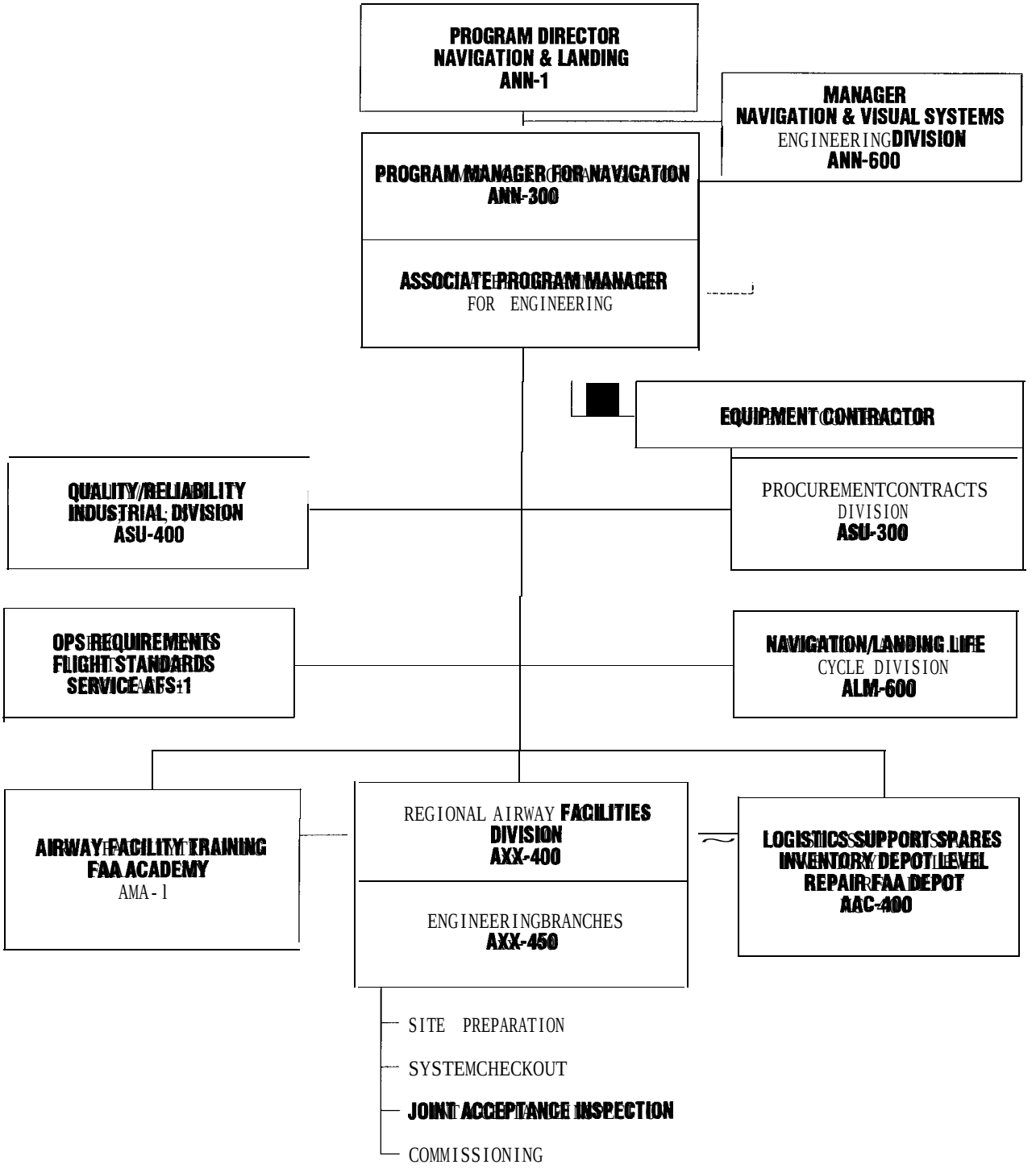

k. Order 6850.2A, Visual Guidance Lighting Systems, December 17, 1981.

l. Order 6950.2C, Electrical Power Policy Implementation National Airspace System Facilities, November 1987.

m. MIL-STD-461, Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, October 15, 1987.

n. MIL-HDBK-217B, Reliability Stress and Failure Rate Data for Electronic Equipment.

o. RADC-TR-75-22, Nonelectronic Reliability Notebook.

p. MIL-C-24308, General Specifications for Electrical Connectors.

q. EIA-RS-232, Interface Between Data Terminal Equipment and Data Communications Employing Serial Binary Data Interchange.

58.-59. RESERVED.

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CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Deployment of PAPI systems is conducted by the FAA Logistics Center at the Aeronautical Center and the FAA regions. As regional funds become available, requests from the regions to satisfy airport requirements are honored by the FAA Logistics Center. The PAPI with RMS is shipped by the FAA Logistics Center to the site where it is stored for installation. Installation of the equipment is the responsibility of the region. The PAPI Deployment Readiness Review (DRR) schedule is shown in Table 7-1, PAPI with RMS DRR Schedule.

TABLE 7-1. PAPI WITH RMS DRR SCHEDULE

EVENT	DATE
(NBP)	
Delivery to T&E Site	06/13/94
Shakedown Testing Complete	08/31/94
Final Report to Assoc. Admin.	09/22/94
Excom Meeting	10/06/94

71. SITE PREPARATION. The regions are responsible for preparing the sites where PAPI equipment will be installed. Site preparation includes planning for installation and integration with the RRCS at both the tower and at the runway location. Considerations for site preparation include weather conditions and concurrent construction activities.

72. DELIVERY. PAPI systems will be shipped to the FAA Logistics Center and will be available to the regions under the constraints of fiscal year funding. The FAA Logistics Center ships equipment to the regions as requests are made and in accordance with the quantities called out in the project status report (PSR). Projected delivery dates are contained in Chapter 4. Implementation of the NBP buy is scheduled to be started by October 12, 1994. Systems will be delivered at a rate of ten per month.

73. INSTALLATION PLAN. The FAA regions shall coordinate the receipt, installation, and evaluation of all equipment required to form the PAPI system. The PAPI with RMS shall be installed in

accordance with national standard drawings and standards revised to fit the individual site. The regional office shall coordinate the complete installation, alignment, and operational tests on all identified PAPI interfaces to assure full compliance with FAA specifications and performance. The initial review and approval of installation drawings will be accomplished during the shakedown testing at the designated test site. Upon completion of this testing, final installation standards will be provided to the regions. The contractor shall provide engineering support services for on-site advice, including technical supervision to FAA technicians and the installation contractors concerning the proper interfacing of the A/G receiver, RRCS, TCCC, and RMMS to the PAPI with RMS when required. Performance analysis and evaluation reports shall be forwarded to the FAA regional office for acceptance.

74. CONFIGURATION MANAGEMENT PLAN. Configuration Management (CM) is the process used to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status. Configuration items of concern for this implementation are the LHA and PCA which contain embedded RMS with interface modem RS-232 ports. The CM discipline shall be applied to all configuration items included in the PAPI with RMS baselines to ensure compatibility between elements within the PAPI with RMS. All additions and changes to the PAPI with RMS baselines shall be proposed in the form of a case file and shall be reviewed for recommended approval or disapproval by a configuration control board (CCB). All changes to the NAS site design baseline, the LHA's, PCA, and the RMS interface must be processed and approved by the Navigation and Landing CCB.

a. Acquisition Phase Configuration Management. The Navigation and Landing CCB controls the establishment of and changes to the PAPI with RMS baselines during the acquisition phase. For PAPI with RMS matters, the CCB will include members from ANN-600, AOS-200, ASR-100, AFZ-200, AL-600, ASE-300, ASE-600, ACN-100, ACD-110, AVN-500, ANS-100, AIM-1, AAS-100, AFS-400, ASU-300, ASU-400, ANC-1, AOV-100, ATR-100, the SEI contractor, and the Configuration Management Division, ASE-20. The ANN CCB is responsible for ensuring that the functional, performance, and interface requirements allocated to the PAPI with RMS subsystems are reflected in the baselines and in any changes to those baselines until product acceptance. The ANN CCB is also responsible for ensuring that baseline documentation is accurate and reflects PAPI with RMS operational requirements. The responsibility for the functional and allocated baselines

will remain with ANN-l throughout the PAPI life cycle. The transition of configuration management responsibilities associated with PAPI with RMS products occurs at acceptance by the ANN CCB designated representative of the contractor's delivered, installed, integrated, and tested product. Product acceptance is based on successful operational readiness demonstration (ORD) of the complete PAPI system. Configuration management accountability for the product baseline remains the responsibility of ANN-1 until achieving last ORD. Following last ORD product acceptance, the change control functions for the product transition from the ANN CCB to the Maintenance Engineering (ME) CCB.

b. Operational Support Phase Configuration Management. During the operational support phase and for the entire life-cycle of the implemented hardware enhancements, configuration management functions will consist of maintenance and change control management of site as well as product baseline. The ME CCB assumes baseline and change control management of the LHA, PCA, and the RMS interface hardware and software products, associated peripherals and documentation following last ORD via Memorandum of Agreement (MOA). The ME CCB is responsible for change control management of the PAPI with RMS product baseline by MOA. Product baselines are maintained by the National Airway Systems Engineering Division (AOS-200) personnel in the field. The contractor shall provide engineering changes to AOS-200 when the changes are released and prior to field implementation. AOS-200 shall evaluate the changes and approve the change for field implementation via a case file. The CM functions assigned to the ME CCB are described in the ME CCB charter.

75.-79. RESERVED.

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CHAPTER 8. VERIFICATION

80. FACTORY VERIFICATION. The contractor performs a series of tests in accordance with the requirements of the contract, the equipment specification, FAA-G-2100e, Electronic Equipment, General Requirements, and other documents prior to acceptance of the equipment by the FAA. These tests, design qualification tests, type tests, and production tests will demonstrate that all hardware, software, and all performance requirements are met before the FAA accepts a PAPI system from the contractor.

81. CHECKOUT. Each PAPI will be shipped from the contractor's facility with a complete set of Equipment Instruction Books. After installation of equipment by the regions, FAA personnel will conduct checkout tests in accordance with the contractor developed equipment instruction books. The procedures to be followed will include testing of electrical interfaces, mechanical hardware and diagnostic capabilities, verifying system and remote maintenance monitoring performance, and verifying maintenance capability and adequacy of support hardware and software.

82. CONTRACTOR INTEGRATION TESTING. Not applicable.

83. CONTRACTOR ACCEPTANCE INSPECTION. Not applicable.

84. FAA INTEGRATION TESTING. These tests are conducted to verify that the PAPI system has been integrated as specified and that it can interface with the specified external systems. Included are tests that verify the operation of multiple interfaces and integration with other systems in the operational environment. At this point in time, the PAPI system should have been adapted to parameters of the operational equipment with which it must interface.

85. SHAKEDOWN AND CHANGEOVER. System shakedown is the critical period of testing that is performed after the FAA takes full responsibility for equipment/systems and software from the equipment manufacturer. Shakedown testing will verify and validate all PAPI system interfaces at each operational site. Evaluations to determine the adequacy and acceptability of procedures and operations to demonstrate an initial operating capability shall be accomplished prior to system shakedown. System shakedown ends when JAI activities begin. During system shakedown, tests and checks are conducted on the automated system to verify that it functions properly, meets operational

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CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. MAINTENANCE CONCEPT. The maintenance concept for the PAPI system shall consist of both site and FAA Logistics Center repair. FAA maintenance technicians will replace PAPI with RMS components down to the LRU and may perform limited repair/corrective and preventative maintenance functions as required, on-site. FAA Logistics Center maintenance will consist of receipt and repair/replacement of failed LRUIs.

91. TRAINING. The training program for the PAPI system consists of a site-level maintenance course covering the LRU removal/replacement at the site level and component level repair training for FAA Logistics Center technicians. Site-level training requirements are met by FAA Course 40144, Precision Approach Path Indicator (PAPI) with Remote Monitoring Subsystem (RMS). Training course graduates are able to configure the PAPI system for normal operation, troubleshoot and repair the system to the LRU level and perform and document all periodic maintenance. Training on PAPI LRU repair for FAA Logistics Center technicians has been conducted previously. Due to some minor design changes in the PAPI RMS, a one time training course covering component level repair of the new LRUIs contained in the redesigned PAPI RMS will be required. The training will be conducted at the contractor's facility prior to system deployment. FAA Logistics Center course graduates will possess sufficient knowledge to troubleshoot and repair all LRU's to the component level.

92. SUPPORT TOOLS AND TEST EQUIPMENT. PAPI system support tools and test equipment consist of both site and FAA Logistics Center level support and test equipment, including all common and special tools, as well as any connectors or other interface devices necessary to connect the support equipment to the end item or unit under test. Site level test equipment is supported at the AF sector office having responsibility for the visual aid facility. FAA Logistics Center level test equipment is supported by the FAA Logistics Center. The contractor will provide a list of the common and special tools, test/support equipment, interface devices and connectors required for maintaining PAPI with RMS equipment at the site level of maintenance. Special tools, test/support equipment, and/or interface devices required to support the PAPI with RMS will be kept at a minimum. Special tools or test equipment required for initial adjustments (i.e., aiming instrument), testing, and/or maintenance of the PAPI with RMS are provided with the equipment.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. MAINTENANCE CONCEPT. The maintenance concept for the PAPI system shall consist of both site and FAA Logistics Center repair. FAA maintenance technicians will replace PAPI with RMS components down to the LRU and may perform limited repair/corrective and preventative maintenance functions as required, on-site. FAA Logistics Center maintenance will consist of receipt and repair/replacement of failed LRUIs.

91. TRAINING. The training program for the PAPI system consists of a site-level maintenance course covering the LRU removal/replacement at the site level and component level repair training for FAA Logistics Center technicians. Site-level training requirements are met by FAA Course 40144, Precision Approach Path Indicator (PAPI) with Remote Monitoring Subsystem (RMS). Training course graduates are able to configure the PAPI system for normal operation, troubleshoot and repair the system to the LRU level and perform and document all periodic maintenance. Training on PAPI LRU repair for FAA Logistics Center technicians has been conducted previously. Due to some minor design changes in the PAPI RMS, a one time training course covering component level repair of the new LRUIs contained in the redesigned PAPI RMS will be required. The training will be conducted at the contractor's facility prior to system deployment. FAA Logistics Center course graduates will possess sufficient knowledge to troubleshoot and repair all LRU's to the component level.

92. SUPPORT TOOLS AND TEST EQUIPMENT. PAPI system support tools and test equipment consist of both site and FAA Logistics Center level support and test equipment, including all common and special tools, as well as any connectors or other interface devices necessary to connect the support equipment to the end item or unit under test. Site level test equipment is supported at the AF sector office having responsibility for the visual aid facility. FAA Logistics Center level test equipment is supported by the FAA Logistics Center. The contractor will provide a list of the common and special tools, test/support equipment, interface devices and connectors required for maintaining PAPI with RMS equipment at the site level of maintenance. Special tools, test/support equipment, and/or interface devices required to support the PAPI with RMS will be kept at a minimum. Special tools or test equipment required for initial adjustments (i.e., aiming instrument), testing, and/or maintenance of the PAPI with RMS are provided with the equipment.

99. EQUIPMENT NOT FURNISHED. Maintenance data terminals for local control and monitoring of the airport RMS are not provided through the equipment contracts or through the program office. This equipment is provided by the Maintenance Automation Program.

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APPENDIX 1. LIST OF ACRONYMS AND ABBREVIATIONS

ac	Alternating Current
A/G	Air-to-Ground
AF	Airway Facility
Amp	Ampere
APMC	Associate Program Manager for Contracting
APME	Associate Program Manager for Engineering
APML	Associate Program Manager for Logistics
APMQ	Associate Program Manager for Quality
APMT	Associate Program Manager for Testing
ATCT	Air Traffic Control Tower
bps	Bits Per Second
CAI	Contractor Acceptance Inspection
CCB	Configuration Control Board
CCD	Configuration Control Document
CM	Configuration Management
co	Contracting Officer
COTR	Contracting Officer's Technical Representative
dc	Direct Current
DRR	Deployment Readiness Review
DTE	Data Terminal Equipment
FAA	Federal Aviation Administration
FRDF	Facility Reference Data File
GFE	Government Furnished Equipment
Hz	Hertz
ICAO	International Civil Aviation Organization
ILSP	Integrated Logistics Support Plan
ICC	Initial Operating Capability
JAI	Joint Acceptance Inspection
kHz	KiloHertz
LCU	Link Control Unit
LHA	Lamp Housing Assembly
LRU	Line Replaceable Unit
MCC	Maintenance Control Center
ME	Maintenance Engineer
mHz	MegaHertz
MOA	Memorandum of Agreement
MPS	Maintenance Processor Subsystem
MTBF	Mean Time Between Failure
NAILS	National Airspace Integrated Logistics Support
NAILSMT	NAILS Management Team
NAS	National Airspace System
NBP	New Bedford Panoramex
ORD	Operational Readiness Demonstration

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